Office of Energy Efficiency and Renewable Energy

Low-Cost, Continuous-Cast Aluminum Sheet

Background

Decreasing vehicle weight is one of the most effective ways of increasing automobile fuel efficiency, second only to increasing powertrain efficiency. The Partnership for a New Generation of Vehicle goal is to increase fuel efficiency from 27.5 to 80 mpg; 20-30% of this increase is expected to be achieved by lowering the vehicle weight from the current 3,200 lb to 2,000 lb. However, the public demands that the lighter vehicles be comparably sized, safe, and have about the same initial cost as current vehicles. While recent concept cars and a few aluminum-intensive production vehicles are about the same size and have the same (or better) safety ratings, their initial costs are 10-50% higher than those of comparable vehicles made of steel.

Since 1996, the Lightweight Vehicle Materials Program, part of the U.S. Department of Energy's Office of Advanced Automotive Technologies, has supported research aimed at reducing the cost of aluminum for automobiles. In one project, researchers examined a continuous-casting process for the sheet that is used to make structural and outer panels for cars. The current process involves casting alloyed aluminum into very large (approximately 30,000-lb) ingots, which are homogenized, hot-rolled, cold-rolled, and annealed many times. In the new continuous-casting process, the alloyed aluminum is cast directly onto a thin slab, hot-rolled in line, and annealed. Before this breakthrough, continuous-cast aluminum sheet typically did not have the combination of mechanical properties required for use in automobiles.

Accomplishments

- By using a combination of alloys and thermal treatment, researchers developed a continuous-cast and hot-rolled 5754 alloy aluminum sheet that has properties as good or better than those of 5754 sheet produced by the ingot method.
- Preliminary estimates indicate that this breakthrough could reduce the cost of producing the sheet from primary (raw molten) aluminum by 10-25%.

Aluminum Casting

Benefits

- At the current low prices for primary aluminum, the cost of 5754 sheet could fall near or below the $1/lb target that would make aluminum competitive with steel for more automotive applications.
- Reducing the weight of automobiles results in lower petroleum consumption and fewer pollutant emissions.

Future Activities

- Demonstrate the continuous-casting process for more than one alloy.
- Reduce uncertainties associated with the process so that the aluminum industry will invest in this discovery.

Partners in Success

Reynolds Metals Corporation
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